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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

HARAN, JOHN T

ART UNIT PAPER NUMBER

1733

DATE MAILED: 12/18/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

09/757,364

Applicant(s)

CHAN ET AL.

Examiner

John T. Haran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 17-20 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 14 and 15 is/are allowed.
- 6) ☒ Claim(s) 1-13 and 16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 January 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

1. This office action is in response to the amendment and arguments filed on 9/17/03. All previous rejections are withdrawn.

Response to Declaration

2. The declaration filed on 9/17/03 under 37 CFR 1.131 has been considered but is ineffective to overcome the Wang reference.

The evidence submitted is insufficient to establish a reduction to practice of the invention in this country or a NAFTA or WTO member country prior to the effective date of the Wang reference. Applicant indicates in the declaration that the invention was reduced to practice prior to the Wang reference as evidenced by the attached copy of invention disclosure (Paragraph 3), however the copy of the invention disclosure was not received.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami (U.S. Patent 6,133,066) in view of either of Chen et al (U.S. Patent 5,873,161) or Higashi et al (U.S. Patent 5,918,113) and taken with Kunz (U.S. Patent 4,803,124).

Murakami discloses a method for attaching a semiconductor element to a circuit board wherein a semiconductor element (planar substrate) with conductive electrode bumps is aligned with a circuit board (planar substrate) having conductive mounting pads so that the bumps and mounting pads are aligned, then a sealing epoxy resin (liquid polymeric material), which acts as an underfill, is supplied to the circuit board, then the semiconductor element is pressed to spread the resin outward such that the bumps contact the mounting pads, and then the resin is cured (Column 4, line 50 to Column 5, line 11; Figures 1G-1H). Murakami is silent towards bonding one substrate to another using the disclosed method.

One skilled in the art would have readily appreciated that both Murakami and the present application are both directed to bonding two conducting surfaces wherein liquid polymeric material is dispensed on the lower surface without covering the entire surface and the upper surface is pressed against the liquid polymeric material causing the liquid polymeric material to flow toward the edges and fill the space between the two surfaces. One skilled in the art would have readily appreciated that the method of Murakami would work whether the upper surface was the surface of a chip or the surface of a substrate because both are substantially planar and possess conducting surfaces such as contact pads. Furthermore, it is well known and conventional to bond conducting surfaces of two substrates with a curable adhesive as shown for example in Chen et al (See Figures 3a-3h bonding circuit layer substrates) or Higashi et al (See Figures 12a-b bonding wafer substrate to a mounting substrate) and one skilled in the art would be amply motivated to apply a known method for bonding planar surfaces with conducting

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surfaces together to bonding planar substrates with conducting surfaces together. One skilled in the art also would have readily appreciated that the surface area to be bonded between two substrates would be larger than a chip and a substrate. Accordingly one skilled in the art would have readily appreciated adjusting the volume and shape of the adhesive based upon the surface area of the bonding surface and applying the necessary amount and configuration of adhesive to achieve the desired bond as is known in the art, as shown for example in Kunz (Column 1, lines 42-50). It would have been obvious to one of ordinary skill in the art at the time the invention was made to bond two substrate surfaces that are planar and have conductive surfaces in the method of Murakami, as suggested in Chen et al or Higashi et al, and to provide the necessary amount and configuration of adhesive for a given surface area of the bonding surface between the substrates, as suggested in Kunz.

Regarding claim 2, Murakami teaches that the conducting surfaces contact each other after pressing the liquid polymeric material.

Regarding claims 3 and 4, Murakami is silent towards the polymeric material being dispensed on a plurality of dies present on one of the substrates or towards one of the substrates having a planar surface area of at least about 36 square inches. It is well known and conventional in the art for substrates, such as circuit layers taught in Chen et al, to have a planar surface of at least about 36 square inches and for substrates to have a plurality of dies, such as the wafer taught in Higashi et al, to have a plurality of die areas to be electrically connected to another surface. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use well

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known and conventional techniques in the art such as bonding circuit layers with planar surface areas of at least about 36 square inches or bonding wafer substrates that have a plurality of dies areas to be electrically connected to another surface in the method of Murakami, as modified above.

Regarding claims 5 and 6, Murakami is also silent towards the electrode bumps being made of solder with a fluxing agent however it is notoriously well known and conventional for electrode bumps to be made of solder and for the solder bumps to contain a solder material fluxing agent, as shown for example in Chen et al (Column 6, lines 6 and 16-17). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the electrode bumps be solder bumps that contain a solder material fluxing agent in the method of Murakami.

5. Claims 7-9 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami (U.S. Patent 6,133,066) in view of either of Chen et al (U.S. Patent 5,873,161) or Higashi et al (U.S. Patent 5,918,113) and taken with Kunz (U.S. Patent 4,803,124) as applied to claims 1-6 above, and further in view of Wang (U.S. Patent 6,476,676).

Murakami is silent towards the underfill epoxy sealing resin containing a polymer fluxing agent. It is well known and conventional for underfill epoxy sealing resins to contain polymer fluxing agents and for the underfill material to comprise from about 15% by weight to 70% by weight of a polymeric resin, about 15% to 70% by weight of a curing agent, and from 0.10% to 20% by weight of fluxing agent, as shown for example

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in Wang (See Examples). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use well known and conventional underfill resin in the method of Murakami, as modified above. Furthermore, one skilled in the art would have readily appreciated that the necessity of having a fluxing agent in both the polymer and the solder bumps is duplicative and it would have been within the purview of one skilled in the art to have a fluxing agent in both the polymer and the solder bumps or in just one.

6. Claims 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami (U.S. Patent 6,133,066) in view of either Chen et al (U.S. Patent 5,873,161) or Higashi et al (U.S. Patent 5,918,113) and taken with Kunz (U.S. Patent 4,803,124) as applied to claims 1-6 above, and further in view of Wang (U.S. Patent 6,476,676) as applied to claims 7-9 above, and further in view of Stefanowski (U.S. Patent 5,334,260).

It is well known and conventional to use phenylacids such as phenylacetic acid in fluxing agents, as shown for example in Stefanowski (Column 3, lines 20-28). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use well known and conventional fluxing agents in the method of Murakami, as modified above.

7. Claims 7-9 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami (U.S. Patent 6,133,066) in view of either of Chen et al (U.S. Patent 5,873,161) or Higashi et al (U.S. Patent 5,918,113) and taken with Kunz (U.S. Patent

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4,803,124) as applied to claims 1-6 above, and further in view of Zhou et al (U.S. Patent 5,985,043).

Murakami is silent towards the underfill epoxy sealing resin containing a polymer fluxing agent.

Regarding claims 7-9 it is well known and conventional for underfill sealing resins to contain polymer fluxing agents as shown for example in Zhou et al (See Column 2, lines 12-21). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use well known and conventional underfill resin in the method of Murakami, as modified above. Furthermore, one skilled in the art would have readily appreciated that the necessity of having a fluxing agent in both the polymer and the solder bumps is duplicative and it would have been within the purview of one skilled in the art to have a fluxing agent in both the polymer and the solder bumps or in just one.

Regarding claims 16, it is also well known and conventional for underfill sealing resins to have polymer resin, fluxing agent, and a curing agent, as shown for example in Zhou et al (See Column 2, lines 12-21). One skilled in the art would have readily appreciated that the exact percentages of the components in the resin would depend upon a variety of factors such as the materials worked upon and it would have been within the purview of one skilled in the art to determine the necessary make up and percentages of the sealing resin.

8. Claims 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami (U.S. Patent 6,133,066) in view of either Chen et al (U.S. Patent 5,873,161)

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or Higashi et al (U.S. Patent 5,918,113) and taken with Kunz (U.S. Patent 4,803,124) as applied to claims 1-6 above, and further in view of Zhou et al (U.S. Patent 5,985,043) as applied to claims 7-9 above, and further in view of Stefanowski (U.S. Patent 5,334,260).

It is well known and conventional to use phenylacids such as phenylacetic acid in fluxing agents, as shown for example in Stefanowski (Column 3, lines 20-28). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use well known and conventional fluxing agents in the method of Murakami, as modified above.

Allowable Subject Matter

9. Claims 14 and 15 are allowed.

10. The following is an examiner's statement of reasons for allowance:

The prior art fails to suggest a fluxing agent comprising a beta phenylacrylic acid and/or a beta phenylhydroxyacrylic acid. Absent any art showing a fluxing agent comprising either types of acid the subject matter of claims 14 and 15 are considered allowable.

11. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

12. Applicant's arguments with respect to claims 1-13 and 16 have been considered but are moot in view of the new ground(s) of rejection.

It is noted that Applicant argues that Murakami would not be applicable to joining substrates because large scale roughening of the contact pads would not be easily accomplished, however one skilled in the art would have readily appreciated using a larger stamper tool or applying the same stamper tool to a substrate in sections until the entire substrate is treated.

Also, as noted above, the declaration was insufficient to remove the Wang reference in the absence of the invention disclosure and as such Wang remains available as a reference. Upon receipt of a copy of the invention disclosure the adequacy of its teachings to remove Wang as a reference will be considered. However, it is also noted, that an additional reference, Zhou et al, which is available as a reference under 102(b), has been used to make an additional rejection of the same claims as Wang and can not be sworn behind.

Conclusion


13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **John T. Haran** whose telephone number is **(703) 305-0052**. The examiner can normally be reached on M-Th (8 - 5) and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on (703) 308-3853. The fax phone

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number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.


John T. Haran
Examiner
Art Unit 1733